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Impact of the dietary transition to minimise environmental impacts on micronutrient intakes: a systematic literature review

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Food systems transformation is required to respect planetary boundaries, ensure nutrition security and protect human health. Micronutrients (Mn) are metabolic drivers of the physiological processes involved in growth, development and maintenance of health. The impact of a dietary shift towards predominantly plant-based foods on Mn intakes and status is unknown. The objective was to systematically review the available literature to assess the impact on intakes of Mn of concern and those potentially affected by a decrease in meat and dairy intakes, including vitamins A, D and B_{12}, folate, calcium, iron, iodine, and zinc.

Following the PRISMA guidelines, the review protocol was registered prospectively with PROSPERO [CRD42021239713]. Seven electronic databases were searched for articles published between January 2011 and October 2022. Two independent reviewers completed title and abstract screening, followed by full-text analysis.

Fifty-six studies fulfilled the inclusion criteria. Most studies were from high-income countries (n=49; 21 from the Netherlands and France); 45 studies were based on dietary modelling analyses and 10 described dietary intake data. There was one randomised controlled trial (RCT). The most frequently reported Mn was iron (all 56) and the least was iodine (n=20). Greenhouse gas emissions (GhGEs) were the most frequently reported environmental outcome (n=41). The RCT compared three levels of plant-protein intake; as the proportion of plant-protein increased, intakes of vitamin B_{12}, iodine and zinc decreased and iron and folate increased. While different approaches were used in the dietary intake and modelling studies, most analyses sought to reduce GhGEs, adhere to the Eat-Lancet reference diet (EAT- Lancet)(1) or reduce animal foods by substituting with plant-based foods. Diets with lower GhGEs had lower intakes of zinc, iron, calcium, vitamin D, vitamin B_{12} and vitamin A. Diets with a higher proportion of plant-protein showed similar results, except iron intake was higher. Two studies reported higher iron intakes in participants adhering best to the EAT- Lancet, however, one study reported a lower heme iron intake, raising a bioavailability question. In the dietary models targeting meat reduction, vitamin B_{12} and zinc intakes were consistently reduced. Calcium intake decreased, particularly in children when dairy was reduced. Folate and iron intakes increased in many studies, however, few studies attempted to address bioavailability, with evidence of increased iron intakes coupled with reduced heme iron intake. Intakes of vitamin D were low at baseline and did not change. Dietary optimisation showed that achieving diets meeting nutritional and environmental constraints is technically feasible.

Studies of dietary intake highlight differences in Mn intakes associated with indicators of environmental impact such as GhGE. Dietary modelling studies successfully achieved lower environmental impacts, however several studies encountered limitations in Mn availability, highlighting the difficulty of meeting nutrient intake targets among vulnerable groups.

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Reference

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